WD-C METHOD
CL-022R

SAMPLING SOLID WASTES WITH DAAMS

Revision: 3
Date Effective: July 2008

Method Approval:

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Directorate of Environmental Programs

WEST DESERT TEST CENTER
CHEMICAL TEST DIVISION

DUGWAY PROVING GROUND
Dugway, Utah 84022-5000

1.0 Scope and Application

This method provides procedures to sample headspace air surrounding containerized solid waste samples using Depot Area Air Monitoring System (DAAMS). This method is applicable to monitoring regulatory compliance regulated wastes at Dugway Proving Ground (DPG). Chemical agents GA, GB, GD, GF, HD, HN3, and VX are typically sampled using this method and analyzed using WD-C METHOD: CL-052R, *Chemical Agents in DAAMS by Gas Chromatography*.

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General quality control (QC) guidelines for sampling, sampling equipment, and chain-of-custody are found in the *Quality Assurance Program Plan for the Analysis of Chemical Agent-Related Waste* (QAPP). A method schematic is provided in Figure 1.

2.0 Scientific Basis

Solid waste samples are containerized and allowed to equilibrate as described in this method. Headspace above solid waste samples is sampled using an appropriate sorbent. Chemical agents GA, GB, GD, and GF are collected using Chromosorb® 106. VX is passed through a silver fluoride conversion pad then collected on Chromosorb® 106. HD and HN3 are collected using Tenax® TA. To ensure the stability of HD on the Tenax® TA, HD samples are scrubbed through a nitrogen oxide (NO_x) pre-filter.

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Do not expose DAAMS tubes to high temperatures, considerable moisture, or to volatile organic compounds (such as fuels, solvents, roofing tars, natural gas, or pesticides), as these elements may cause inaccurate sample results.

HD decomposes in the presence of trace silver fluoride. Do not use sampling equipment that has been used with silver fluoride conversion pads for HD sampling. Consult the analytical laboratory for advice regarding the proper use of DAAMS.

3.0 Terminology

This section lists in alphabetical order all terms, abbreviations, and acronyms unique to understanding this method.

- CAS – Chemical Abstract Number
- CCTF - Combined Chemical Test Facility

- Chemical Agent - Any of several highly toxic chemical compounds (including GA, GB, GD, GF, HD, HN3, and VX) that are intended for use in military operations
- COC - Chain-of-Custody
- DAAMS - Depot Area Air Monitoring System
- Decontamination - The process of decreasing the amount of chemical agent on any person, object, or area by absorbing, neutralizing, destroying, ventilating, or removing chemical agents
- DPG - Dugway Proving Ground
- GA - Tabun: Ethyl N,N-dimethylphosphoroamidocyanidate CAS 77-81-6, a nerve agent
- GB - Sarin: Isopropyl Methylphosphonofluoridate CAS 107-44-8, a nerve agent
- GD - Soman: Pinacolyl Methylphosphonofluoridate CAS 96-64-0, a nerve agent
- GF - Cyclohexyl Methylphosphonofluoridate CAS 329-99-7, a nerve agent
- HD - Mustard, Distilled: Bis-2-chloroethyl sulfide CAS 505-60-2, a blister agent
- HN3 - tris-2-chloroethylamine, CAS 555-77-1 a blister agent
- L/min - liters per minute
- MSDS – Material Safety Data Sheet
- PPE – Personal Protective Equipment
- QAPP - Quality Assurance Program Plan
- QL Standard - A standard used to verify the calibration. QL standards are prepared in the laboratory by spiking unexposed DAAMS tubes with a solution of dilute chemical agent and, aspirating with laboratory air to remove residual solvent. QL standards are not aspirated with sample air.
- QP Sample - A quality control (QC) sample used to establish method accuracy and precision. QP samples are prepared (in duplicate) in the laboratory by spiking unexposed DAAMS tubes with a solution of dilute chemical agent and, if necessary aspirating with laboratory air to remove residual solvent. QP samples are sent into the field with the sample tubes and aspirated with sample air.
- QC - Quality Control
- Sample Collection Lot - Samples collected from the same waste description at the same time
- VX - O-ethyl-S-(2-diisopropylaminoethyl) methylphosphonothioate CAS 50782-69-9, a nerve agent

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<#>HN2 - Bis- (2-chloroethyl) methylamine, CAS 51-75-2, a blister agent¶

- µm - micrometer(s)

4.0 Safety

Generally, regulatory compliance wastes have been exposed to chemical agent and subsequently have been decontaminated or contain other hazardous substances. Handle all samples with caution. For all operations involving chemical agents, comply with all Army rules and regulations. Be familiar with and follow safety guidelines contained in applicable Material Safety Data Sheets (MSDS) for chemicals being used or sampled.

Sample Collection Personnel shall be trained in the proper use of personal protective equipment. In addition, they shall have completed DPG and Chemical Test Division safety training for handling chemical agents.

Before beginning sampling, Sample Collection Personnel must fully understand the waste to be sampled and take appropriate safety precautions. Wear the following minimum personal protective equipment: protective eye wear, gloves, and sturdy shoes. Use appropriate engineering controls (such as a fume hood) to ensure safe operating conditions. Exercise caution when opening drums or other sealed containers.

Obtain appropriate clearances before entering restricted areas. Do not transport samples in private vehicles.

5.0 Apparatus and Reagents

The following items may be required to collect solid waste samples:

- Solid sorbent tubes packed with Chromosorb® 106 or Tenax® TA,
- Restricted flow orifice (0.4 - 0.6 liters per minute),
- Teflon line (0.25 inch outside diameter),
- Ice chest with ice or blue ice packs,
- Air pump,
- NO_x filters,
- Silver fluoride conversion pads,
- Sampling logbook,
- Sampler Request Form and Collection Sheet,

- Dust filters,
- Connecting hardware for tubes and filters or pads,
- Timing device with resolution and accuracy sufficient to read to the nearest minute,
- Packing tape, and/or
- Material for containerizing solids, (i.e., plastic bags, plastic sheet material, etc.).

6.0 Standards and Quality Control

Field QC samples are intended to measure the cleanliness and representativeness of the sampling activities. Sample Collection Personnel will collect one field blank per sample collection lot. The laboratory will provide at least two spiked DAAMS tubes ("QP" samples) per 20 samples collected. Sample Collection Personnel will aspirate QP samples in test sample air at the sampling location for the same length of time as the samples.

Confirmation of positive samples is required. Collect duplicate samples by attaching a "Y" junction to the vacuum source. A DAAMS tube backed by a flow control device (critical orifice or needle valve) is attached to each branch of the “Y” junction.

7.0 Procedure

To sample solid waste with DAAMS, Sample Collection Personnel perform the following procedures:

- Preparing Samples, and
- Collecting Samples.

7.1 Preparing Samples

To prepare samples, Sample Collection Personnel perform the following tasks.

- Ensure that chemical agent-related solid waste samples have been thoroughly decontaminated prior to analysis as required by Army rules and regulations. To the extent possible, disassemble items prior to decontamination.

- Ensure that the solid waste is dry following decontamination operations. Several products (such as JOY® soap, TIDE® detergent, bleach, or caustic alcohol) may interfere with the analysis if not thoroughly rinsed from the solid wastes

Place the dry solid waste in a sealed container and allow the contents to equilibrate for at least four hours at a temperature of 21°C (70 °F) or higher. The sealed container will be of sufficient volume to permit sampling of the equilibrated air volume without allowing dilution air to enter the sealed container. The sampled volume should not exceed the volume of the container. The sample port must be secured (e.g., taped) to eliminate dilution from incoming air.

- Note: Extremely high temperatures may compromise sampling effectiveness. For small items, place in a plastic bag having a minimum thickness of two millimeters (approximately 50 µm), and heat if necessary. Place larger items in a roll-off or gondola sealed with a tarp or similar material, and heat if necessary. Note: Three samples must be collected from a roll-off or gondola – one from each end and one from the middle.

- Remove the DAAMS tubes from cold storage and ensure that they have attained ambient temperature.

- Assemble the sampling train with tubing and the hardware provided in the order shown in Figure 2.

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7.2 Collecting Samples

To collect samples, Sample Collection Personnel perform the following tasks.

After the four-hour equilibration period, carefully cut a small hole in the sealed container (e.g., plastic bag or tarp) and insert the DAAMS monitoring line into the container as far as possible. The sample port must be secured (e.g., taped) to eliminate dilution from incoming air into the container.

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- Conduct air sampling operations at temperatures of 21°C (70°F) or higher. If necessary, heat all transfer lines using a thermal wrap and heat samples using gas or electric heaters to this temperature. Document sample temperature and the use of any thermal wrap in the sampling logbook.

- Depending on the total volume required, run the vacuum source for a specific length of time at a set flow rate.

- Turn off the pump.

- Record the following information related to sample collection, as it occurs, using a field logbook or worksheet:

  - Sampling personnel (name and signature),
  - Sample collection date,
  - Sample collection start and end times,
  - Location of material sampled,
  - Sample identification (drum number, barcode number, etc.),
  - Description of material sampled (i.e., historical information, description of phases, etc.),
  - Identifying marks or numbers on sample container, if any,
  - Sample collection method and description,
  - Beginning and ending temperature,
  - DAAMS tube number used,
  - Personal protective equipment (PPE) worn,
  - Unusual or hazardous conditions, and
  - Other observations.

- Complete the Chain of Custody (COC)/Analysis Request form prior to submitting the sample to the laboratory. The information on the COC/Analysis Request form should be consistent with the information recorded in the field records. Mark the COC/Analysis Request form to indicate which analytes are to be determined and note unusual or potentially hazardous conditions.

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- Disassemble the sampling apparatus, and cap the DAAMS tubes.
- Place the DAAMS tubes in an insulated transport canister on cold blue ice packs.
- Transport DAAMS tubes to the issuing laboratory. A non-insulated transport canister may be used provided the contents are kept cold.
- If DAAMS tubes are not to be used immediately, keep them in a secured, properly labeled refrigerator that is approved for the storage of chemical agents.

8.0 Data Reduction and Assessment

The QC review process includes review of sampling documentation. The spike sample results are interpreted as reflective of the sampling process.

9.0 References

Quality Assurance Program Plan for the Analysis of Chemical Agent-Related Waste, March 2007, U.S. Army Dugway Proving Ground.

Figure 1

Method Schematic

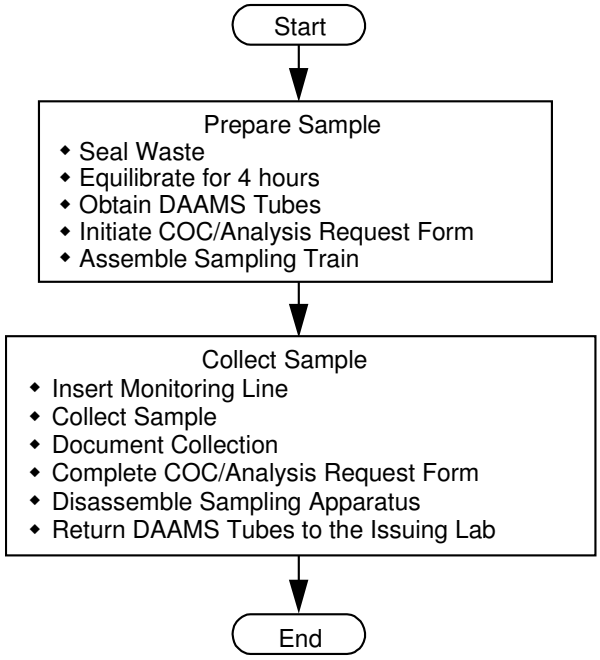

Figure 2

Sampling Train Assembly